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# Regional Multiteam Systems in Cancer Care Delivery

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## Abstract

Teamwork is essential for addressing many of the challenges that arise in the coordination and delivery of cancer care, especially for the problems that are presented by patients who cross geographic boundaries and enter and exit multiple health care systems at various times during their cancer care journeys. The problem of coordinating the care of patients with cancer is further complicated by the growing number of treatment options and modalities, incompatibilities among the vast variety of technology platforms that have recently been adopted by the health care industry, and competing and misaligned incentives for providers and systems. Here we examine the issue of regional care coordination in cancer through the prism of a real patient journey. This article will synthesize and elaborate on existing knowledge about coordination approaches for complex systems, in particular, in general and cancer care multidisciplinary teams; define elements of coordination derived from organizational psychology and human factors research that are applicable to team-based cancer care delivery; and suggest approaches for improving multidisciplinary team coordination in regional cancer care delivery and avenues for future research. The phenomenon of the mobile, multisystem patient represents a growing challenge in cancer care. Paradoxically, development of high-quality, high-volume centers of excellence and the ease of virtual communication and data sharing by using electronic medical records have introduced significant barriers to effective team-based cancer care. These challenges urgently require solutions.

## INTRODUCTION

The recent Institute of Medicine report, “Delivering High-Quality Cancer Care: Charting a New Course for a System in Crisis,” concludes that the cancer care delivery system in the United States is in crisis as a result of a growing demand for cancer care, increasing complexity of treatment, a shrinking workforce, and rising costs.<sup>1</sup> Within the context of cancer care delivery, the basic units of care delivery are care teams, known as multidisciplinary cancer teams (MDTs) or tumor boards. In this paper, we explore how problems faced by cancer care teams reflect some of the issues of cancer care delivery at large.

The MDT is a clinical team that meets periodically, either virtually or face-to-face. Cancer MDTs typically include surgeons, medical and radiation oncologists, pathologists, radiologists, nutrition experts, geriatricians, nurses, social workers, and other providers who are involved in the care of patients with cancer.<sup>2</sup> The basic premise of the cancer MDT is that the collective expertise of the team provides better decision making for the management of disease. For the purposes of this analysis, we define a team as two or more individuals who interact dynamically, interdependently, and adaptively to achieve a common goal.<sup>3,4</sup> Cancer care decisions should be reviewed by multiple specialists who all have an equal voice in the MDT.<sup>5-8</sup>

## ASSOCIATED CONTENT



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Effectiveness of MDTs depends on the coordination of the team: its ability to share information and resources so that all parties can accomplish their parts in support of a mutual objective.<sup>9-11</sup> In the case of patient M (Table 1), her care is fragmented, expensive, and inefficient because her providers do not share a common vision of an optimal outcome—patient functional status, length of survival, satisfaction with care; they may have conflicting financial incentives and communicate inadequately so that appointments get cancelled, optimal times for interventions are missed, and patient health deteriorates.

The national epidemiologic data indicate that the vast majority of patients with cancer in the United States, like patient M, are treated not in one, but in several, health care institutions during their cancer care journeys.<sup>12,13</sup> Studies using national data have indicated significant disparities in cancer outcomes between patients who are treated in large academic centers of excellence, where standardized pathways have been implemented and MDTs operate to some extent,

and those treated at community and rural hospitals, where standardized pathways and team-based care protocols are typically lacking.<sup>14,15</sup> Furthermore, there is no clear evidence that large, regional cancer care teams, as they currently stand, fit the traditional definition of a team. Whereas evidence demonstrates a positive impact of MDT on patient outcomes and costs of care in a single institution, it is unclear whether the benefits of team-based coordination approaches could still be observed at a regional scale and not be dwarfed by the complexities of managing a region-wide enterprise.<sup>16,17</sup>

The core issue we focus on in this paper is coordination mechanisms in team-based cancer care. We synthesize existing knowledge about coordination approaches for complex systems and define elements of coordination that have been derived from organizational psychology and human factors research that are applicable to regional, team-based cancer care delivery. We conclude by suggesting approaches for improving MDT coordination in regional cancer care delivery and for future research.

Table 1. Patient Case Summary: Patient M

Characteristic	Value
Age, years	64
Sex	Female
Family status	Widowed
Health insurance	Medicaid
Comorbidities	Ovarian cancer (primary) Rectal cancer (secondary) Hypertension Arthritis
Providers/institutions	Dr P, primary care provider Dr X, rural general surgeon, hospitals B and C Dr AA, colorectal surgeon, academic medical center A Dr O, medical oncologist, community infusion center D Mrs N, oncology care coordinator, community infusion center D

NOTE. Patient M is a 64-year-old widowed woman with stage IV ovarian cancer causing colonic obstruction who was referred to a large academic medical center 180 miles away from her home. She has undergone surgeries in two institutions closer to her home and has recently been receiving chemotherapy at her home hospital. On the day before her scheduled colectomy at the academic medical center, the patient called her surgeon to tell him that she would not be able to make it to the hospital because of weakness and exhaustion that had persisted after her last round of chemotherapy.

PURPOSE

Although many factors facilitate efficient team work—the “7 Cs” of effective teams: cooperation, coordination, communication, cognition, conflict, coaching and conditions—failure to coordinate effectively is a key reason for poor-quality patient care.<sup>18</sup> Health care is often perceived by patients as a team sport<sup>19</sup>; however, health care services and training generally have not incorporated the sciences of team performance, management, and organization as developed for other industries.<sup>9,16,20</sup> Medicine has also been slow to learn from psychology and social sciences, which continue to provide new knowledge for the optimization of team coordination.

A few such elements that are directly applicable to the cancer care setting are highlighted in Table 2. For teams to function efficiently, three core coordination mechanisms must be activated<sup>10,21</sup>:

*Shared mental models:* MDT members, in addition to their expertise and individual roles within the team, should have a shared vision of what they aim to accomplish. Evidence from observational studies of MDTs has repeatedly shown that the biomedical elements of disease often sideline other considerations within the team decision-making process; nonphysician MDT members often remain silent and fail to contribute what could be valuable information to the case review.<sup>22,23</sup> In the

**Table 2. Key Elements of Team Coordination Applicable to Cancer Care Settings**

Key Element	Explanation	Application
Coordination and task interdependence	When there is no interdependence among different tasks, coordination is not needed; each task can be completed in isolation by a different team member. Greater need for coordination emerges as team tasks, resources, and people become increasingly interdependent. Greater interdependence indicates greater work complexity for a team.	Cancer care is a complex task that requires coordination at all levels, with disease, treatment activities, and leadership changing over time, including care settings, resources, and clinical/administrative tasks.
Coordination as an input v an output of teamwork	<p>The process of coordinating can be defined as the activities carried out by team members when managing dependencies.</p> <p>The state of being coordinated, that is, coordination as an outcome, can be defined as the extent to which dependencies have been managed effectively by the team.</p>	<p>Coordination is present both as an input and as an output of cancer MDTs. Effective care planning, information sharing, and availability of IT systems facilitate the coordinating process.</p> <p>High-quality, guideline-compliant care and good outcomes without excessive cost that are seamlessly received and experienced by patients and their families/caregivers are outputs of team-based care delivery.</p>
Explicit v implicit coordination	Explicit coordination requires a constant exchange of time-sensitive information. Implicit coordination develops as team members acquire expertise with the task and experience working together and, thus, work on the basis of shared mental models of their collective work within a trusting working relationship.	Standardized pathways and checklists, assigned leadership roles, automated dashboards, IT, and other systems can facilitate the explicit coordination of the cancer MDT. Team members who work jointly within a supportive organizational culture and with mutual respect for each other develop further implicit coordination mechanisms that augment the provision of explicit coordination and reduce the burden and distraction of continuous information exchange.

Abbreviations: IT, information technology; MDT, multidisciplinary team.

absence of a shared mental model, providers have to rely on explicit communication to outline every step, which could be overtaxing, especially in the fast changing environment of a busy clinic.<sup>24-27</sup>

*Closed-loop communication:* MDT recommendations and the rationale for the care plan should be clear to all team members; discordance within the team should be noted. Communications regarding MDT decisions and actions should be explicit, stemming from a shared understanding of the treatment plan. Improved communication could be facilitated by structured checklists and protocols,<sup>28</sup> ideally in electronic form, that communicate directly with the shareable patient electronic health records (EHRs). These protocols should allow streamlined communications within the cancer center or hospital and between the cancer center and the primary care facility to which the patient will ultimately return. Increasingly, proposals in the literature suggest that patients should also have clear expectations about their treatment plans and should be given

a version of the care protocol, preferably in advance of treatment, in a language that is transparent and meaningful to them.<sup>29,30</sup>

*Mutual trust across all individuals involved in patient care:* Team-based care processes are facilitated by a trusting work environment.<sup>31,32</sup> Trust facilitates formation of shared mental models, ensures that team members perform the actions they are responsible for according to the treatment plan, and recognizes and protects the rights and interests of all team members. Trust in teams is often linked to the wider organizational culture within which MDTs operate.<sup>7</sup>

## METHODS AND RESULTS

### Levels of Team Coordination

From a systems-level perspective,<sup>33</sup> using an appropriate level of coordination is critical for the optimal functioning of the team. On the basis of organizational thinking, we have created a simple coordination framework for regional cancer

care (Fig 1). The framework outlines organizational, economic, structural, technological, and other systems requirements that are needed to achieve the coordination of care that is being delivered across a geographic region; these are complementary to what we would define as human factors–driven, team-based coordination mechanisms.

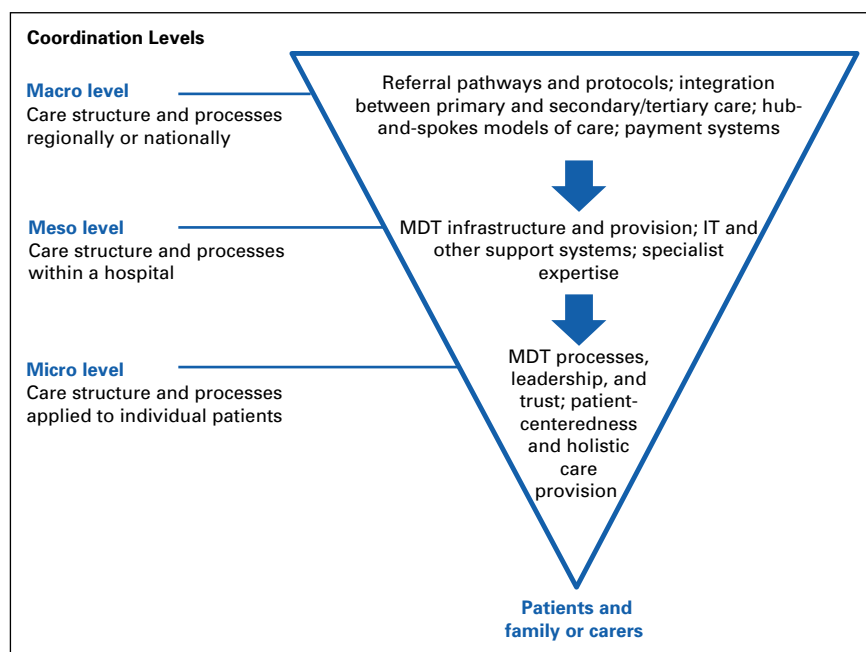
At the highest level of complexity, macro-level coordination requires a shared cross-organizational mission and standardized systems of provider training and referrals, including self- or primary care referrals to a secondary or tertiary care setting. Established pathways and structures are external, ideally evidence-based mechanisms to achieve coordination between care structures—from home and self-care to tertiary care centers and back—to reduce uncertainty and relieve the burden on patients and staff who are involved in scheduling, waiting times, and delays in treatment. Reimbursement systems should support this structure and not antagonize it. For example, clinicians should not be financially penalized for referring patients to specialists outside their network if a within-network option is not available. At the macro-level, regional cancer care teams can function as large, hybrid, regional multiteam systems (MTSs),<sup>16,17</sup> with designated leadership and subteams of specialists or individual clinics.

At the meso level of coordination, care processes must be coordinated within each health care delivery organization—that is, community oncology clinic, cancer center, or tertiary care specialized hospital—which could be viewed as traditional teams or subteams of the regional MTS. Technologic and information technology infrastructure needs to be in place, as well as access to specialists. Specialists should have the time and financial motivation to organize care in MDTs, for example, the ability to bill for time spent on care coordination or to use designated care coordinators funded by payers or regional MTSs.

At the micro level, coordination is required within patient care teams to help the patient access care and make the most appropriate clinical decisions, which should then be implemented in a timely manner. The patients, their preferences, and their family and psychosocial circumstances, for example, insurance, family resources, social support networks, and place of residence, should be at the core of this decision-making process.

### Team Coordination Failures in Our Case Study

Here, we explore the team coordinating mechanisms and levels of coordination reviewed above from both the systemic and human factors perspectives and in light of our case



**FIG 1.** Levels of coordination required for cancer care delivery, from a regional care system to the care of individual patients. IT, information technology; MDT, multidisciplinary team.

study (Table 1 and Appendix, online only). The case of patient M illustrates many of the challenges that are encountered in the provision of high-quality cancer care to a patient living in a rural community. Issues arise with communication and liaison between clinical teams, with collating information and explicitly identifying who has ownership of the patient's care at each stage of treatment, and with understanding and incorporating patient preferences.

Fragmentation of care across five care settings, three of which are surgical centers, suggests that coordination, at any one of the three levels identified in Fig 1, is overly complex and likely to fail. Specific areas where critical coordination difficulties occurred included lack of overall care plan and explicit communication with the patient about her preferences and role in care coordination process. For example, did she feel confident making decisions about referrals and the timing of procedures? Furthermore, no arrangements had been made to identify an appropriate patient care navigator for patient M as her health deteriorated and her daughter was no longer available to fill this role.

As a result, patient M's diagnosis and treatment were delayed, missing the optimal window for intervention, while she was scheduled to receive surgery, for example, palliative surgical management of terminal cancer, that could have been timed better. We can infer that, as a result of poor care coordination, patient M's survival was shortened and her insurance plan spent much more on her care than expected for such a case. In addition to the negative impact on patient health and the unnecessary burden on the payer, this multisite, multispecialty, multi-provider, and multi-institutional complexity could also lead to conflicts for providers who are torn between making decisions in the best interests of their patients versus the financial and competitive interests of their institutions. This type of conflict also contributes to burnout and diminished professional satisfaction.<sup>34-36</sup> It could also impair communication among specialist groups and lead to cross-provider blaming and secrecy.<sup>16</sup>

### Application of the Multilevel Care Coordination Framework

In this section, we summarize how appropriate implementation of the three levels of coordination and activation of the necessary coordination mechanisms (Fig 1) could address the shortcomings of patient M's case.

#### *Macro-level coordination.*

This case is a good example of how a standardized referral system or a network of hub-and-spoke centers—with established evidence-based referral pathways as well as shared EHRs—could avoid service duplication and delays and ensure that all providers work toward the same goal. In this case, it seems that the patient has taken on the role of coordinating her own care—a role we cannot assume all patients are able or willing to undertake—and makes decisions about the choice of provider, institution, timing of treatment, transportation, payment, and other factors.

#### *Meso-level coordination.*

Once the patient reached center A, the existing team structure of this center would take over the leadership role for the time of surgical treatment. The surgical team would have the ability to plan the surgery effectively on the basis of the information they had acquired from shared EHRs about previous surgeries. Surgical and chemotherapy treatments would be scheduled in relation to each other and their timing optimized.

#### *Micro-level coordination.*

Outcomes and treatment goals explicitly desired by the patient should become focal points of the MDT review to gain patient adherence to a long-term management strategy and the ability to self-care. In the case of patient M, staff at the community infusion center tried to fill this void, although they were not fully successful in coordinating care outside of the infusion center. Despite this limitation, Mrs. N, the infusion center care coordinator, was able to identify the patient's emotional and informal caregiving needs and address them in a patient-centered acceptable way by using locally available resources. This is an example of how a shared mental model, a culture of trust and respect, and timely and appropriate communication between the clinical team and the patient could produce a dramatic improvement in the patient experience of treatment and care efficiency.

## DISCUSSION

In this section, we describe evidence-based sustainable solutions, highlight critical implementation issues, and discuss future areas for research of teamwork in cancer care delivery: use of trained oncology care coordinators and patient navigators, team-care principles across regions and organizations, and overcoming heterogeneity in EHR systems across various institutions. Although this paper focuses on care coordination, we take the view that any successful improvement to teamwork will have to address, at least in part, all 7 Cs of effective teams.<sup>18</sup>



## Use of Trained Oncology Care Coordinators and Patient Navigators

A growing body of evidence indicates that trained navigators for patients with cancer could be effective and cost-effective in improving patient–provider communication, treatment adherence, and patient satisfaction, especially among vulnerable populations with limited health literacy and no regular source of care.<sup>37–42</sup> Patient navigators often come from the same community as the patients themselves and understand the patient's culture. The navigator accompanies the patient throughout the entire treatment journey, across all care settings and providers, and at the same time helping to solve problems and overcome any barriers she may experience, both personally and clinically. Navigators can help patients communicate and build relationships with providers, educate patients about the importance of scheduled tests and procedures, and assist with adherence to complex treatment regimens. They can also help arrange appointments and transportation, complete disability paperwork and insurance enrollment forms, clarify discharge instructions, and link patients with available resources in the community as needed.

A hypothesis to be evaluated in future research is whether navigators can improve coordination at both micro level and meso level (Fig 1), the former via directly assisting patients and the latter via broad understanding of care structures. Research should also evaluate the requisite skillset that enables navigators to achieve these roles as well as how to optimally scale up the patient navigation model into both primary and specialty care for patients with cancer. Whereas most current evidence of the impact of patient navigators comes from programs in which patient navigators were affiliated with primary care providers or patient-centered medical homes,<sup>42</sup> there are also examples of patient navigation developed by community health organizations and cancer centers.<sup>40,43</sup> Several organizations have introduced standardized training programs for patient navigators, including both classroom and online versions.<sup>44,45</sup> Finally, evidence suggests that providing patients with trained navigators is a cost-effective alternative to the current approach in which patients rely on their informal networks for help.<sup>37</sup>

## Team-Care Principles Across Regions and Organizations

Although the exact structures and processes of regional cancer services coordination may differ from region to region, some general principles can be learned from the successes of other initiatives that have fostered the performance of large teams.

In situations in which groups of participating providers become large and task specialization increases, including various medical specialties, nonmedical industries have adopted a team-of-teams or MTS organizational form.<sup>10,16,17,46,47</sup>

The specific practical approaches used by MTSs include community and stakeholder engagement strategies, workforce development and training (Appendix Table A1, online only),<sup>18,25–27,48</sup> use of telemedicine solutions to overcome distance barriers,<sup>49–51</sup> and pathway standardization.<sup>52,53</sup> A hypothesis for further research in this area is that regional coordination could be achieved by raising the role of payers and insurers and giving them authority for care coordination across various health care delivery systems. The rationale for the hypothesis is that, aside from the patient, the payer is the only stakeholder who has information about the entire patient care journey and, hence, is a potential driver of regional coordination. Key challenges of reliance on the payer to oversee global care coordination have to do with the degree to which the payer is able to build provider trust. In the absence of such a challenge, payers have demonstrated excellent team work and care coordination results.<sup>54</sup> Further research should focus on learning from experiences of single health care systems and organizations that have implemented telemedicine and standardized care pathways and understanding their impact on care processes and outcomes.

## Overcoming Heterogeneity in EHR Systems Across Institutions

We argue that the introduction of the EHR is an example of disruptive innovation in health care.<sup>55</sup> This is not because the EHR by itself is disruptive and leads to fragmentation, but because of how EHR systems have often been implemented and used: with minimal or no training for providers and with inflexible methods to make adjustments when needed—for example, adding another provider to the pull-down menu of options for referral and communication. The example of an efficient and adaptable EHR system is the one that has been developed by the Department of Veterans Affairs (VA).<sup>56</sup> Currently, the VA is working to create a next-generation EHR—not just incremental changes to the existing EHR—to anticipate emerging needs and a range of opportunities to better integrate patient care, including through teamwork.<sup>56</sup> A clear research opportunity here centers on developing optimal mechanisms of EHR implementation, including personnel training and workflow modification. Effective implementation should be hypothesized to link to improved

care coordination and improved patient outcomes and satisfaction.

In conclusion, the phenomenon of a mobile, multisystem patient is a growing challenge in cancer care. There is an urgent need to improve care coordination and expedite multisite, multispecialty, multi-institutional team-based care. To do that, team scientists should partner with other stakeholders to identify common interests, learn to work together, develop infrastructure for their work, and appreciate multiple perspectives. Potential solutions may include wider use of oncology care navigators, changes in reimbursement for time spent in provider-provider consultations and decision making, thoughtful redesign of information technology systems, and development of standardized regional referral pathways.

Despite general support of MTSS, systematic barriers to regional MTS implementation in cancer care have also been identified, including misunderstanding of MTS goals among clinicians and health care leadership, substantial discomfort on the part of individual providers when expected to give up their authority on treatment decisions, cultural resistance to MDT initiatives, financial and organizational disincentives for cross-disciplinary collaborations, and a shortage of individuals with the specific training and expertise necessary for formation and efficient performance of MDTs.<sup>57-59</sup> For instance, lack of billing codes for care coordination or team-based care in oncology represents a substantial financial barrier that prevents physicians from spending time on provider-provider care coordination planning or decision making.

The synergy that grows from bringing multiple disciplines together can result in new insights and methods that will more rapidly advance research on effective team-based care and make team-based regional cancer delivery a new norm.<sup>60</sup> JOP

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## AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

### Regional Multiteam Systems in Cancer Care Delivery

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## Appendix

### Complete Description of the Case Study

Patient M, a 64-year-old widowed female patient with stage IV ovarian cancer causing colonic obstruction, patient M was referred to a colorectal surgeon in large academic medical center A 180 miles away from her home. The obstruction was diagnosed by her primary care physician, Dr. P, after she complained for several months of bloating and constipation. She has undergone several surgeries for her ovarian cancer in two other hospitals, B and C, closer to her home in a small rural town and has recently been receiving chemotherapy at her community infusion center D. She describes her experience with the local surgeon, Dr. X, who operated on her in hospitals B and C, as “confusing” and “exhausting.” Dr. X is a general surgeon who covers a large region and has clinics in various towns on different days of the week. Patient M was especially frustrated when she had problems after her surgeries. She had only Dr. X’s local clinic number, which played a recorded message when Dr. X was out of town. Patient M was admitted to the emergency room at her local hospital while the emergency room staff tried to contact Dr. X by calling several locations to obtain a better understanding of patient M’s surgical history before deciding how to manage her complications. Hospitals B and C and Dr. X’s clinic all used different, incompatible EHR systems. Finally, patient M discussed her frustration with Dr. X and he referred her to a colorectal surgeon, Dr. AA, at academic medical center A.

After an appointment and discussion with Dr. AA, patient M was scheduled for colon removal. A day before her scheduled surgery, however, the patient called Dr. AA to tell him that she would not be able to make it to the hospital because she was still feeling exhausted and weak after her last round of chemotherapy. Her emergency surgery was cancelled.

Patient M really liked the staff at the infusion center who knew her and her family well and were flexible in accommodating her other health care needs and coordinating services and appointments for her whenever possible. For instance, she could get her flu shot after an infusion session and have blood work done in the laboratory affiliated with the infusion center. The infusion center staff also ran a support group for patients with gynecologic cancer that often took place at the same time the women were receiving their chemotherapy. The infusion center also coordinated group therapy sessions for interested patients, for example, exercise and nutrition, problem solving therapy, and cognitive behavioral therapy for sleep problems, and shared information about local resources with members of the support group, for example, contact information for specialists and hair salons that work with wigs, local caregivers and home health agencies, links to county and state public health programs for survivors of cancer, and others. This support group was essential for patient M when her daughter, who was her primary caregiver throughout treatment, delivered twins and was no longer able to drive patient M to appointments and help with daily chores.

Patient M describes herself as “jockeying” between her surgeon in Rochester, a primary care physician almost 200 miles away, and a specialist somewhere in between, and she assumes “all doctors talk to one another all the time.” Her oncology care coordinator, Mrs. N, told her about Hope Lodge in Rochester, a bed-and-breakfast facility for out-of-area patients with cancer that is supported by the American Cancer Society. However, a patient staying there without a caregiver faces certain challenges. Hope Lodge does not provide medical or personal care; therefore, patients need to be self-sufficient. If patients cannot clean up after themselves, staying at Hope Lodge is not an option. For example, when patient M developed severe diarrhea after her chemotherapy, she had difficulty cleaning up after accidents. Hope Lodge staff can communicate with social services, and visiting nurse service may be brought in, but patient M was too embarrassed to discuss her problems with anyone.

To make matters worse, patient M’s providers often used her home phone number to communicate with her about last minute changes in appointments and tests. As a result, messages were left on her home phone 200 miles away while she was just down the road from the academic medical center; she often failed to receive time-sensitive information in the messages.

**Table A1. Example of Team Skills Building Curriculum:  
University of Rochester's Care Manager Education Program**

Module	Curriculum
1	Care management role
2	Importance of outcome metrics
3	Utilizing evidence-based practice to manage transitions and plan care
4	Interprofessional communication and its impact on patient safety
5	How to participate in and lead teams
6	The Self-Determination Theory of motivation and how to use it with patients
7	Assessing and planning individualized education for patients with differing backgrounds and levels of health literacy
8	Current trends and expectations for ongoing development as a professional care manager